

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1 1. (Currently amended) A method for reducing data burst overhead
2 in an Ethernet passive optical network which includes a central node and at least
3 one remote node, wherein downstream data from the central node is broadcast to
4 the remote nodes, and wherein upstream data from each remote node is
5 transmitted to the central node in a unicast manner, the method comprising:
6 transmitting grant messages to a number of remote nodes, wherein a grant
7 message for a specified remote node assigns a start time and a duration of a
8 transmission timeslot in which the specified remote node may transmit an upstream
9 data burst; and
10 receiving a number of upstream data bursts, wherein the time gap between
11 two consecutive upstream data bursts is less than the summation of a default laser
12 turn-on time, a default laser turn-off time, an automatic gain control (AGC)
13 period, and a clock and data recovery (CDR) period;
14 wherein a preceding upstream data burst's laser turn-off period overlaps
15 with a subsequent data burst's laser turn-on period;
16 wherein the non-overlapping portion of the preceding data burst's laser
17 turn-off period is equal to or greater than twice the allowed maximum jitter of the
18 round-trip time between the central node and a remote node; and
19 wherein the non-overlapping portion of the subsequent data burst's laser
20 turn-on period is equal to or greater than twice the allowed maximum jitter of the
21 round-trip time between the central node and a remote node.

1 2. (Cancelled)

1 3. (Cancelled)

1 4. (Currently amended) The method of claim 21, wherein a grant
2 message specifies a transmission timeslot start time that is earlier than the ending
3 time of an immediately preceding transmission timeslot.

1 5. (Original) The method of claim 1, wherein receiving a number of
2 upstream data bursts involves receiving a number of consecutive data bursts from
3 a remote node, wherein the remote node is allowed to transmit the number of
4 consecutive data bursts without turning off and turning on its laser between two
5 consecutive data bursts.

1 6. (Original) The method of claim 5, further comprising detecting
2 the time gap between two consecutive transmission timeslots assigned to the
3 remote node; and
4 if the time gap is less than a pre-defined value, allowing the remote node
5 to transmit upstream data during the time gap without turning off and turning on
6 its laser.

1 7. (Original) The method of claim 1, wherein if one or more remote
2 nodes are virtual remote nodes located in a common physical remote node, and if
3 these virtual remote nodes transmit upstream data through a common laser
4 belonging to the common physical remote node, the method further comprises:
5 allowing the common laser to keep transmitting upstream data without
6 being turned off between consecutive transmission timeslots assigned to one or
7 more virtual remote nodes located in the common physical remote node.

1 8. (Original) The method of claim 7, wherein a grant message
2 contains a
3 laser-turn-on flag and a laser-turn-off flag;
4 wherein if a grant message's laser-turn-on flag is true, the corresponding
5 remote node turns on its laser at the start time of its assigned transmission
6 timeslot and transmits an AGC bit sequence and a CDR bit sequence before
7 transmitting upstream data;
8 wherein if a grant message's laser-turn-on flag is false, the corresponding
9 remote node immediately starts transmitting upstream data at the start time of its
10 assigned transmission timeslot without transmitting an AGC bit sequence and a
11 CDR bit sequence;
12 wherein if a grant message's laser-turn-off flag is true, the corresponding
13 remote node turns off its laser after transmitting upstream data; and
14 wherein if a grant message's laser-turn-off flag is false, the corresponding
15 remote node continues transmitting data until the end of its assigned transmission
16 timeslot without turning off its laser.

1 9. (Original) The method of claim 7, wherein if one or more remote
2 nodes are virtual remote nodes located in a common physical remote node, and if
3 these virtual remote nodes transmit upstream data through a common laser
4 belonging to the common physical remote node, the method further comprises
5 allowing the common laser to keep transmitting the upstream data bursts without
6 being turned off between consecutive transmission timeslots assigned to one or
7 more virtual remote nodes located in the common physical remote node.

1 10. (Original) The method of claim 1, further comprising receiving an
2 actual
3 laser turn-on time and an actual laser turn-off time from a remote node;

4 wherein the actual laser turn-on and turn-off times specify the amount of
5 time required by the remote node to turn on and turn off its laser, respectively.

1 11. (Original) The method of claim 10, wherein the actual laser turn-
2 on and turn-off times are transmitted with a registration message from the remote
3 node when the central node initially registers the remote node.

1 12. (Original) The method of claim 10, wherein a grant message
2 assigns a start time and a duration of a transmission timeslot based on the actual
3 laser turn-on and turn-off times of the remote node to which the grant message is
4 destined.

1 13. (Currently amended) An apparatus for reducing data burst
2 overhead in an Ethernet passive optical network, comprising:
3 at least one remote node; and
4 a central node configured to,
5 transmit grant messages to a number of remote nodes, wherein a
6 grant message for a specified remote node assigns a start time and a
7 duration of a transmission timeslot in which the specified remote node
8 may transmit a upstream data burst; and
9 receive a number of upstream data bursts, wherein the time gap
10 between two consecutive upstream data bursts is less than the summation
11 of a default laser turn-on time, a default laser turn-off time, an AGC
12 period, and a CDR period;
13 wherein the central node is configured to broadcast downstream data to the
14 remote nodes; and
15 wherein each remote node is configured to transmit upstream data to the
16 central node in a unicast manner;

17 wherein a preceding upstream data burst's laser turn-off period overlaps
18 with a subsequent data burst's laser turn-on period;
19 wherein the non-overlapping portion of the preceding data burst's laser
20 turn-off period is equal to or greater than twice the allowed maximum jitter of the
21 round-trip time between the central node and a remote node; and
22 wherein the non-overlapping portion of the subsequent data burst's laser
23 turn-on period is equal to or greater than twice the allowed maximum jitter
24 of the round-trip time between the central node and a remote node.

1 14. (Cancelled)

1 15. (Cancelled)

1 16. (Currently amended) The apparatus of claim 4413, wherein a
2 grant message specifies a transmission timeslot start time that is earlier than the
3 ending time of an immediately preceding transmission timeslot.

1 17. (Original) The apparatus of claim 13, wherein a remote node is
2 configured to transmit a number of consecutive data bursts without turning off
3 and turning on its laser between two consecutive data bursts.

1 18. (Original) The apparatus of claim 17, wherein the remote node is
2 further configured to detect the time gap between two consecutive transmission
3 timeslots assigned to the remote node; and
4 if the time gap is less than a pre-defined value, allow the remote node to
5 transmit upstream data during the time gap without turning off and turning on its
6 laser.

1 19. (Original) The apparatus of claim 13, wherein if one or more
2 remote nodes are virtual remote nodes located in a common physical remote
3 node, and if these virtual remote nodes transmit upstream data through a
4 common laser belonging to the common physical remote node, the common
5 physical remote node is configured to:
6 allow the common laser to keep transmitting upstream data without being
7 turned off between consecutive transmission timeslots assigned to one or more
8 virtual remote nodes located in the common physical remote node.

1 20. (Original) The apparatus of claim 19, wherein a grant message
2 contains a
3 laser-turn-on flag and a laser-turn-off flag;
4 wherein if a grant message's laser-turn-on flag is true, the corresponding
5 remote node is configured to turn on its laser at the start time of its assigned
6 transmission timeslot and transmits an AGC bit sequence and a CDR bit
7 sequence before transmitting upstream data;
8 wherein if a grant message's laser-turn-on flag is false, the corresponding
9 remote node is configured to start immediately transmitting upstream data at the
10 start time of its assigned transmission timeslot without transmitting an AGC bit
11 sequence and a CDR bit sequence;
12 wherein if a grant message's laser-turn-off flag is true, the corresponding
13 remote node is configured to turn off its laser after transmitting upstream data;
14 and
15 wherein if a grant message's laser-turn-off flag is false, the corresponding
16 remote node is configured to continue transmitting data until the end of its
17 assigned transmission timeslot without turning off its laser.

1 21. (Original) The apparatus of claim 19, wherein if one or more
2 remote nodes are virtual remote nodes located in a common physical remote
3 node, and if these virtual remote nodes transmit upstream data through a
4 common laser belonging to the common physical remote node, the physical
5 remote node is further configured to allow the common laser to keep transmitting
6 the upstream data bursts without being turned off between consecutive
7 transmission timeslots assigned to one or more virtual remote nodes located in
8 the common physical remote node.

1 22. (Original) The apparatus of claim 13, wherein the central node is
2 further configured to receive an actual laser turn-on time and an actual laser turn-
3 off time from a remote node; and
4 wherein the actual laser turn-on and turn-off times specify the amount of
5 time required by the remote node to turn on and turn off its laser, respectively.

1 23. (Original) The apparatus of claim 22, wherein the actual laser
2 turn-on and turn-off times are transmitted with a registration message from the
3 remote node when the central node initially registers the remote node.

1 24. (Original) The apparatus of claim 22, wherein a grant message
2 assigns a start time and a duration of a transmission timeslot based on the actual
3 laser turn-on and turn-off times of the remote node to which the grant message is
4 destined.

1 25. (Currently amended) A computer-readable storage ~~medium~~ device
2 storing instructions that when executed by a computer cause the computer to
3 perform a method for reducing data burst overhead in an Ethernet passive optical
4 network which includes a central node and at least one remote node, wherein

5 downstream data from the central node is broadcast to the remote nodes, and
6 wherein upstream data from each remote node is transmitted to the central node
7 in a unicast manner, the method comprising:
8 transmitting grant messages to a number of remote nodes, wherein a grant
9 message for a specified remote node assigns a start time and a duration of a
10 transmission timeslot in which the specified remote node may transmit a upstream
11 data burst; and
12 receiving a number of upstream data bursts, wherein the time gap between
13 two consecutive upstream data bursts is less than the summation of a default laser
14 turn-on time, a default laser turn-off time, an automatic gain control (AGC)
15 period, and a clock and data recovery (CDR) period;
16 wherein a preceding upstream data burst's laser turn-off period overlaps
17 with a subsequent data burst's laser turn-on period;
18 wherein the non-overlapping portion of the preceding data burst's laser
19 turn-off period is equal to or greater than twice the allowed maximum jitter of the
20 round-trip time between the central node and a remote node; and
21 wherein the non-overlapping portion of the subsequent data burst's laser
22 turn-on period is equal to or greater than twice the allowed maximum jitter of the
23 round-trip time between the central node and a remote node.

1 26. (Cancelled)

1 27. (Cancelled)

1 28. (Currently amended) The computer-readable storage medium
2 device of claim 2625, wherein a grant message specifies a transmission timeslot
3 start time that is earlier than the ending time of an immediately preceding
4 transmission timeslot.

1 29. (Currently amended) The computer-readable storage ~~medium~~
2 device of claim 25, wherein receiving a number of upstream data bursts involves
3 receiving a number of consecutive data bursts from a remote node, wherein the
4 remote node is allowed to transmit the number of consecutive data bursts without
5 turning off and turning on its laser between two consecutive data bursts.

1 30. (Currently amended) The computer-readable storage ~~medium~~
2 device of claim 29, wherein the method further comprises detecting the time gap
3 between two consecutive transmission timeslots assigned to the remote node; and
4 if the time gap is less than a pre-defined value, allowing the remote node
5 to transmit upstream data during the time gap without turning off and turning on
6 its laser.

1 31. (Currently amended) The computer-readable storage ~~medium~~
2 device of claim 25, wherein if one or more remote nodes are virtual remote nodes
3 located in a common physical remote node, and if these virtual remote nodes
4 transmit upstream data through a common laser belonging to the common
5 physical remote node, the method further comprises:
6 allowing the common laser to keep transmitting upstream data without
7 being turned off between consecutive transmission timeslots assigned to one or
8 more virtual remote nodes located in the common physical remote node.

1 32. (Currently amended) The computer-readable storage ~~medium~~
2 device of claim 31, wherein a grant message contains a laser-turn-on flag and a
3 laser-turn-off flag;
4 wherein if a grant message's laser-turn-on flag is true, the corresponding
5 remote node turns on its laser at the start time of its assigned transmission

6 timeslot and transmits an AGC bit sequence and a CDR bit sequence before
7 transmitting upstream data;
8 wherein if a grant message's laser-turn-on flag is false, the corresponding
9 remote node immediately starts transmitting upstream data at the start time of its
10 assigned transmission timeslot without transmitting an AGC bit sequence and a
11 CDR bit sequence;
12 wherein if a grant message's laser-turn-off flag is true, the corresponding
13 remote node turns off its laser after transmitting upstream data; and
14 wherein if a grant message's laser-turn-off flag is false, the corresponding
15 remote node continues transmitting data until the end of its assigned transmission
16 timeslot without turning off its laser.

1 33. (Currently amended) The computer-readable storage ~~medium~~
2 device of claim 31, wherein if one or more remote nodes are virtual remote nodes
3 located in a common physical remote node, and if these virtual remote nodes
4 transmit upstream data through a common laser belonging to the common
5 physical remote node, the method further comprises allowing the common laser
6 to keep transmitting the upstream data bursts without being turned off between
7 consecutive transmission timeslots assigned to one or more virtual remote nodes
8 located in the common physical remote node.

1 34. (Currently amended) The computer-readable storage ~~medium~~
2 device of claim 25, wherein the method further comprises receiving an actual
3 laser turn-on time and an actual laser turn-off time from a remote node; and
4 wherein the actual laser turn-on and turn-off times specify the amount of
5 time required by the remote node to turn on and turn off its laser, respectively.

1 35. (Currently amended) The computer-readable storage ~~medium~~
2 device of claim 34, wherein the actual laser turn-on and turn-off times are
3 transmitted with a registration message from the remote node when the central
4 node initially registers the remote node.

1 36. (Currently amended) The computer-readable storage ~~medium~~
2 device of claim 34, wherein a grant message assigns a start time and a duration of
3 a transmission timeslot based on the actual laser turn-on and turn-off times of the
4 remote node to which the grant message is destined.